

MOVING ON UP: EXTRACT TO ALL-GRAIN

By Bob Peak

It's all about the mash. Most home brewers start the hobby by making extract-based beers. The fermentable sugars may come entirely from liquid or dry malt extract. There also may be a supplemental contribution from a small amount of malted barley steeped as a mini-mash or, a bit larger, a partial mash. In any of these variations, a great deal of the decision making regarding fermentability and color has already been done by the maker of the malt extract. While many brewers are happy with extract brewing for a long time, many others get the urge to exercise more control and creativity over their homebrews. If that's the way you feel, you may be ready to move on up to all-grain brewing.

Three main areas are impacted by a decision to go all-grain: processes, equipment, and ingredients. Want to see how quinoa works as a brewing cereal? Eager to put polenta, whole rice, and pearl barley in a

classic American pilsner? All-grain is the way. You also gain the options of mashing at a low temperature to make a highly fermentable wort (useful if you are trying to make a low-carb beer) or at a high temperature to achieve rich maltiness (strong Scotch ale, anyone?). You can even head off into brewing techniques like single, double, or triple decoctions to give your classic lagers a true German character. You can still use extract as a supplement if you want to, but you won't be tied to decisions already made by someone else on the way to your perfect beer.

What does it take?

First, recognize that much of what you already do as an extract or partial-mash brewer carries over. Once the boil starts, it doesn't matter how you made the wort. You will add hops, boil the wort, cool it, add the yeast, and ferment in whatever way you like. Your kettle, carboys, racking tubes, and packaging supplies (bottles, kegs) may carry over to your all-grain hobby without change.

You will, however, need some more equipment. For this article, we will consider a basic single-infusion mash setup. That's the way most American homebrewers make their all-grain beer and it involves the smallest amount of added equipment. If you get past this step, exploring decoction mashing would be just one more expansion of your hobby.

Equipment for all-grain brewing offers many choices. The processes, however, are fairly straightforward and can offer guidance to equipment choices. That is, we can start with what needs to be accomplished and observe needed equipment, rather than settling on equipment first and then figuring out the process. I recommend this approach

based on experience with new brewers who may say, "I want to build a RIMS (recirculating mash system) or HERMS (heat exchange recirculating mash system) that I read about on the Internet." I will usually answer with a question, "What effect do you want to achieve in your brewing with that system?" Let's start with the process, and let the equipment decisions follow.

First, the mash.

For a five gallon brew, you need to heat around 3 gallons of water to about 160° F, stir in about 10 lbs. of malted barley, and hold that mash mixture near 150° F for 60 to 90 minutes. After that comes mash-out and sparge, but let's talk mashing equipment first. On page 11 of this catalog, you can see the beautiful 3-tier breweries that we manufacture here at The Beverage People. While by no means the only way to do all-grain infusion mashing, it is a good one for illustrating the process. In this method, the middle kettle is fitted with a false bottom or slotted copper ring to hold back the grain and release the wort at the end of the mash. The mashing itself, though, is simply pouring the water into that kettle, firing up the burner until the target water temperature is reached, and stirring in the grain. After turning off the burner, you can wrap or insulate the kettle if you want, or just let it stand—the mash holds the heat remarkably well.

If you are not going to step all the way to a 3-tier, there are two common mashing systems that are less elaborate. One of these is a picnic cooler outfitted with some kind of a perforated or slotted manifold in the bottom for draining wort (lots of do-it-yourself plans are available online). You heat the needed mash water in the boiling kettle you already have for your extract brewing, and pour it into the cooler. Stir in the grain, close the cooler, and let it stand. If you have calculated your starting ("strike") temperature allowing for the cooling effect of the plastic cooler and the room-temperature grain, you have a nicely insulated "mash tun" for your starch to sugar conversion to take place. Even simpler, you can heat the water in that trusty old boiling kettle, stir in the grain (mash in), and put the lid on. Just as with a 3-tier, you may choose to insulate or wrap the kettle. For those more elaborate systems like RIMS or HERMS, there are usually three kettles arranged side-by-side. The mash tun is often in the center, and mashing-in is a lot like a 3-tier. Heat the water, stir in the grain. After that, manual or digital control of a pump is used to recirculate the mashing wort from the bottom of the bed to the top (RIMS), or to pass the wort through a heat exchanger in another kettle of hot water and return it to the mash tun. The tank of hot water is called the hot liquor tank. "Hot liquor" is the brewing term for heated water employed in rinsing or sparging the grain at the end of the mash cycle. RIMS and HERMS are sophisticated techniques

for maintaining uniform temperature and composition of the wort during mashing. So your equipment additions for mashing may be almost none if you use your boiling kettle (although we will get to sparging or lautering next). Or, you may purchase and modify a cooler, make or buy a three-tier system with kettles, or get a hot-wort pump with plumbing and kettles for a recirculating system.

Regardless of how you have mashed, even as simply as using your boiling kettle, you then need to separate the wort from the solid grain. Beyond the initial draining, you will need to “lauter” or “sparge” the grain—rinse it with additional hot water to move the sugars out of the grain bed and into a boiling kettle. The process is enhanced if you can “mash out”; heat the grain and wort mixture to about 170° F to mobilize the sugars and make them easier to rinse through before you start to drain and sparge. For the sparging itself, you will need to heat 5 gallons of water to the same 170° F as the mash-out. Since this water is not at a low pH like beer wort is, you are not restricted to stainless steel or enamel. Any pot will do, and it can even be a combination of pots—as long as the total volume is the same as you plan for your finished beer.

Once you have your mash reheated and your sparge water (“hot liquor”) ready, the most basic lautering is to use a bucket and nylon bag system like our *Santa Rosa Lauter Tun* (pg. 21). Pour a couple of inches of hot water into the bottom of the bucket as a cushion, then pour the hot mash into the bag in the bucket. Let the grain bed settle, rinse out your now-empty boiling kettle, and begin draining the wort back into your boiling kettle. Ladle more hot water (your hot liquor) on top of the grain bed, maintaining a one-inch layer of water on top of the grain. Slowly drain the wort into the boiling kettle, trying to make the process last as much of an hour as you can. When the last of the wort and sparge water has passed through the grain, put the kettle back on the fire and begin your boil. Proceed just as for

extract brewing from the boil onward.

If you have mashed in a cooler with a draining manifold, mashing out is a bit trickier. You can boil some water and mix it in with the grain in the cooler to try to reach 170° F, but you may run out of room. In any case, have your 5 gallons of hot liquor, minus any quantity used to reheat the mash, ready at 170°. Begin draining the wort from the cooler into your boiling kettle, adding hot liquor as above. For a 3-tier system, mash out by restarting the mash tun (middle) burner and stir while heating to 170° F. Also heat the water in the top kettle to 170°. Let the grain bed settle and begin draining and sparging to the lower (boiling) kettle. For RIMS and HERMS systems, use the pump to move hot liquor onto the grain bed and wort to the boiling kettle.

Needed equipment for the 3-tier, RIMS, and HERMS is included in the system. For the picnic cooler method, you need to add a pot or pots adding up to 5 gallons to be the “hot liquor tank.” For the Santa Rosa Lauter Tun method, you need a similar approach to hot liquor heating, plus the lauter tun itself.

And that’s it for processes and equipment! For less than \$50 you can use your boiling kettle, a Santa Rosa lauter tun, and a combination of kitchen pots for hot liquor. You can spend a hundred dollars or so buying and modifying a picnic cooler. For \$1,000 to \$2,000 you can build or buy a 3-tier brewery. For as much as you want to spend, you can build or buy a RIMS or HERMS. With increasing expense comes improved convenience and potentially improved process control as well. While variation from batch to batch is common in home brewing, process control will bring you closer to the way commercial brewers work. Since starch conversion and sugar extraction efficiency are also factors when you use different equipment, you may find that your equipment choices affect your recipe decisions and ingredient choices.

Ingredients for all-grain brewing can be as simple as converting your

existing extract recipes to use malted barley in place of malt extract. For planning purposes you can count on about 28 gravity points per pound per gallon from basic malted barley or wheat, 36 points per pound per gallon from liquid malt extract, and 45 points per pound per gallon from dry malt extract. The following example illustrates calculating a recipe that began with 6 lbs. of dry malt extract and was then converted to 2-row pale malt.

6 lbs. extract at 45 gravity points per pound = 270 total gravity points.

In a 5 gallon batch this equals a starting gravity of 1.054 ($270 \div 5$ gallons = 54)

To convert to grain using about 28 gravity points per pound, start with the same 270 gravity points: $270 \div 28 = 9.6$ pounds, or about 9.5 lbs. of base malt grain in place of 6 lbs. of dry malt extract.

If your mashing system is more or less efficient than an average system, the factor of 28 points per pound per gallon may need to be adjusted for your specific equipment. With a little practice, you can use more or less base grain to achieve your desired gravity. The use of specialty malts can follow the same pattern as mini-mash or partial-mash recipes you have previously used, with a couple of exceptions. To avoid over-converting dextrine or Carapils® malt, you may want to stir that in for just the last 20 minutes or so of your mash. Reducing the conversion will retain more unfermentable dextrans, producing a richer and maltier beer. The other exception concerns the black malts. Mashing these for the full mash period may result in excessive astringency, so you may want to stir some or all of the black malt into the mash part way through the process as well.

Beyond converting recipes from extract to grain and using familiar specialty malts, all-grain brewers have access to a much wider variety of ingredients.

Adjuncts such as flaked or torrefied cereals (rice, maize, barley, rye, oats) can be added directly to the mash where the barley malt enzymes will convert their starches to sugars. For raw grains like rice, polenta, or quinoa, you will need to boil the cereal first to “gelatinize” the starches before stirring into the mash for conversion. As Byron Burch is fond of saying, “If it has sugar or starch in it, we can make alcohol out of it.” So let your imagination run wild! You may need to boil or otherwise pretreat the starch, but if you always wanted to put Cheerios, bagels, or tortilla chips in your beer—all-grain paves the way. Whether it is new equipment, mashing procedures, or exotic ingredients—moving on up to all-grain puts you in control. Ready for the next step? It’s your call.

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